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The Antecedents of Collaborative Behavior for Climate Change Mitigation among South Koreans: The Moderation Analyses of a Sense of Community as Responsibility, Neighborliness, and Trust

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Abstract: The collective efforts of various social actors from different sectors have contributed to climate change mitigation. Identifying the important antecedents of collaborative behavior to address climate change helps us understand the underlying process. This study focused on important theoretical frameworks that determine collaborative behavior as civic engagement. Specifically, the study examines perceived societal risk to future generations, sense of community as responsibility (SOC-R), neighborliness, and trust in collaborative behavior to mitigate climate change. It also investigates the boundary conditions of the effects of societal risk perception on collaborative behavior change by examining the moderating roles of SOC-R, neighborliness, and trust. A nationwide online survey was conducted in South Korea. The findings reveal significant effects of societal risk perception and SOC-R on behavioral intention. Moreover, SOC-R and trust moderated the causal relationship between societal risk perception and behavioral intention, such that the relationship was more pronounced at lower SOC-R and trust. These findings have implications for communication practices and policy making that motivate collective action against climate change in South Korea.

Keywords: climate change; societal risk perception; sense of community as responsibility; neighborliness; trust; social capital; collaboration; moderation analyses



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1. Introduction

In 2015, the United Nations General Assembly established the “Sustainable Development Goals”, which included climate action. Diverse entities from multiple sectors, such as governments, corporations, and citizen groups, have been jointly involved in combatting climate change as a public good. Social science researchers in climate change scholarship have also participated in tackling climate change and its impacts by examining the underlying process of mitigation and adaptation behaviors from a social psychological and communication perspective, including risk perception (e.g., [1–4]). While theoretical frameworks have expanded to effectively address and communicate the issue of climate change, empirical evidence has documented critical predictors and consequences of risk perceptions. Notably, climate change is a societal risk issue [5] that should be addressed at societal and individual levels [2]. However, despite burgeoning research on individual risk perception, there is a dearth of research examining societal risk perception and its effects [6]. More efforts are needed to investigate the societal risk perceptions of climate change.

At the societal level, collaborative behavior contributes to ameliorating climate change [2]. This suggests that researchers should identify critical antecedents that stimulate individuals’ intention to work together towards climate change mitigation. Considerable attention should be devoted to two theoretical grounds—sense of community as responsibility (SOC-R) and social capital—to predict collaborative behavior as civic engagement. Given that

climate change entails the joint efforts of social actors from multiple sectors, an understanding of the antecedents of collaborative behavior for climate change mitigation can advance knowledge of the social dimensions of human behavior and judgment.

To date, few studies have attempted to test the effects of societal risk perception, SOC-R, or social capital resources (i.e., neighborliness and trust) on collaborative behavior regarding climate change, with only a few exceptions (e.g., [2]). They have rarely been compared within a single study and have not been examined even in the South Korean context. The purpose of this study was to investigate whether these antecedents affect collaborative behavior by comparing their significant influences. Moreover, this study analyzed the moderating effects of SOC-R and social capital resources on the relationship between societal risk perception and collaborative behavior. It is crucial to identify and assess any moderating roles because they can illuminate the boundary conditions in the relationship between societal risk perception and collaborative behavior for climate change mitigation.

2. Review of Literature

2.1. Societal Risk Perception and Behavior Change

Risk is the probability of harm or loss occurring, and the potential severity or consequences of that harm or loss [7]. As Slovic [8] emphasized, “risk does not exist “out there”, independent of our minds and cultures” (p. 690); individuals judge a hazardous event or condition with their subjective mental process. Compared to sophisticated experts and analysts, the lay public tends to rely on intuitive judgments of risk, typically referred to as risk perceptions [9]. Risk perception is defined as the subjective evaluation of potential threats from adverse events or activities. This implies that the risk judgments of certain harmful events vary from one individual to another, regardless of the existence of objective real-world hazards.

Risk perceptions comprise two distinct levels, individual and societal, where risk perceptions can operate, respectively or simultaneously. Tyler and Cook [10] articulated these individual- and societal-level judgements. The former refers to people’s beliefs about the chance of damage to themselves, whereas the latter refers to people’s belief that potential risks will affect others or society in general. It is critical to distinguish risk perceptions at different levels, given that a social issue or event can be perceived as having a serious impact on society and its members. For example, climate change risk perception is affected by both levels, and prior research [11,12] has reported that Americans tend to evaluate higher ratings of societal risk perception than individual risk perception of climate change.

Risk perceptions are crucial in predicting behavioral intentions [13] and have been explored as an important determinant of individuals’ decisions to cope with natural hazards, including climate change and floods [14–16]. Jin [1] has explored the effects of climate change risk perceptions on the intention to support relevant policies through the mediating role of risk information-seeking in South Korea. He has revealed that both levels of risk perception of climate change are more likely to be related to the behavioral intention to support policies. Lubell et al. [17] found that societal risks to human welfare, natural resources, and economic development tend to affect activism, such as policy support, political participation, and environmental behaviors. This causal relationship has been demonstrated in diverse contexts of risk.

Climate change must be recognized as a societal risk issue, and not just a problem for individuals or small groups. Governments, corporations, academia, civic groups, and citizens should strive to mitigate the current climate crisis through collaboration and active communication. Given that societal risk is rarely controlled by a single citizen and that reducing societal risk often requires citizens to work together [6], climate crises should be addressed at the societal or collective level, and at the individual level, by appealing to multiple dimensions of human judgment and behavior [3,18]. Social actors from multiple sectors should be jointly involved in addressing the climate change issue as public goods.

Shi et al. [2] found that the societal risk perception of climate change is positively related to the intention to engage in collective action to address climate change.

Climate change is often deemed a distant psychological risk in both time and space [5]. People who perceive climate change to occur to other people and in other places in the future are less likely to take mitigating actions. However, if people feel socially pressured to help reduce the risk of climate change for others such as future generations, they may act to decrease the risk for generations. At the societal level, this study focuses on the perceived risk of climate change for future generations. Although a substantial body of literature on climate change risk communication distinguishes the individual level of risk perception from the societal level, little research, with a few exceptions (e.g., [1,19]), has reviewed and examined the perceived risk of climate change to future generations at the societal level. To clarify the relationship between risk perception and behavioral intention, it is valuable to categorize the conceptual or operational definitions of societal risk perception more explicitly. By focusing on the perception of risk to future generations at the societal level, one can gain a different perspective on the underlying mechanism of judgment and decision making in the process of climate change communication.

This study suggests that people's perception of risk posed to future generations at the societal level affects their intention to collaborate with others. In their risk communication framework, called the societal risk reduction model, Cho and Kuang [6] proposed that societal risk perception is a determinant of the motivation to engage in societal risk reduction action. They also noted that societal risk reduction actions address the social conditions and contexts of risk and may include collective action. When collective action improves the conditions of out-groups rather than in-groups, it is more likely to have an upstream impact on society as a whole. Collaborating to respond to environmental challenges is not limited to benefiting a few individuals or groups, but it can yield social benefits, including public health equity [20] and community resilience [21]. This means that civic and collaborative behavior to mitigate climate change for future generations can be deemed societal risk reduction action that is expected to be affected by societal risk perception. Furthermore, such collaborative behavior for future generations should be seen as an act reflecting the characteristics of social norms and responsibilities [22,23]. Given that individual behavior can be affected by social norms, such as the injunctive kind [24], there will be a sense of social pressure on people to view climate change as a risk in need of action [3,4]. Accordingly, collaborative behavior to mitigate climate change for future generations will be guided by societal risk perceptions. Thus, this study proposes the following hypothesis:

H1. *Societal risk perception of climate change to future generations will increase behavioral intention to collaborate with others for mitigation of climate change.*

2.2. Antecedents of Civic Engagement: SOC-R and Social Capital

Civic engagement in the community for problem solving often requires collaboration with others. As mentioned earlier, climate change issues entail the joint efforts of social actors in multiple sectors. Therefore, it is important to identify and examine the critical antecedents of collaborative behavior in climate change mitigation. This study focuses on two theoretical frameworks that articulate such antecedents: SOC-R and social capital.

2.2.1. SOC-R and Collaborative Behavior

SOC-R refers to “a feeling of personal responsibility for the individual and collective well-being of a community of people not directly rooted in an expectation of personal gain” ([25], p. 231). Nowell and Boyd [25–27] theorized that a sense of responsibility toward the community to which one belongs, evoked by the interaction of personal belief systems with perceived aspects of a social context, drives people's community engagement. The SOC-R suggests that individuals develop their personal belief systems, including norms, beliefs, values, ideologies, and standards, about what is appropriate within a specific social context, as these belief systems are exposed to and embedded in diverse institutions.

That is, people's engagement in the community is guided by a sense of responsibility that emerges from the psychological coherence between their social identity and personal belief structures.

Nowell and Boyd [26] emphasized that the experience of the community as a responsibility is more likely to predict engagement, requiring a greater commitment of time and resources. They articulated that SOC-R directly affects community engagement through the interaction between people's personal belief systems and social contexts, and that community engagement subsequently leads to psychological well-being. To reduce cognitive dissonance between personal beliefs and social contexts, individuals tend to take action to ameliorate their psychological situation. The sufficiency of coherence between a sense of responsibility (what an individual thinks people *should do*) and community engagement (what they can *actually do*) enhances an individual's psychological well-being.

Previous research has found that individuals with higher levels of SOC-R are more likely to exhibit positive behavioral outcomes such as organizational citizenship behaviors and engagement. For example, for-profit and not-for-profit employees with higher levels of SOC-R tend to contribute positively to their workplaces through citizenship behavior [28–31]. These employees are more concerned about the welfare of others and take action to keep their organizations safe from potential problems. Moreover, those with higher levels of SOC-R commit to work and helping other employees [25,29]. These findings provide insights into the influence of SOC-R on community members' civic engagement in collective problems, such as climate change. That is, the direct impact of SOC-R on citizenship and engagement at the organizational level extends to the societal level. Climate crises are viewed as social and global problems for which every entity should take responsibility and require cooperation and solidarity. When members of society experience a sense of responsibility arising from the interaction between their social identity and personal belief systems, they are more likely to work together to deal with climate crises. By evoking community members' norms and values to ameliorate the climate crisis, SOC-R may be a strong predictor of collaboration with others to respond to climate change. Therefore, this study proposes the following hypothesis:

H2. *SOC-R will increase behavioral intention to collaborate with others for climate change mitigation.*

2.2.2. Social Capital (Neighborliness and Trust) and Collaborative Behavior

Civic engagement, particularly collaborative action to achieve shared goals, can be affected by social capital resources, such as social networks and trust [32]. Putnam defined social capital as "connections among individuals—social networks and the norms of reciprocity and trustworthiness that arise from them" (p. 19). He also noted that social capital is closely related to civic virtue, which is enhanced by a dense network of reciprocal social relationships. Social networks and trust are the main sources of social capital. Specifically, the dimensions of social networks include one's memberships in associations and neighborliness [32]. Neighborliness can be created through informal and/or formal connectedness, socializing, and interaction with others in the social structure. Trust refers to "the expectation that arises within a community of regular, honest, and cooperative behaviors based on commonly shared norms on the part of other members of that society" ([33], p. 26). It is also one's confidence in, and willingness to rely on another's actions in a risky situation [34]. As a cognitive dimension in nature, trust is characterized by "the lubricant of the inevitable frictions of social life" ([32], p. 135). Trust can facilitate civic engagement when strong social networks prevail based on mutual acquaintances and recognition [35]. Moreover, these two resources can act as channels to provide more opportunities for civic engagement and collaboration towards shared goals [35].

Social capital is important in climate change mitigation and adaptation. Recent research [36–38] has found empirical evidence that social capital resources are positively related to climate change adaptation behaviors such as engagement in community-improvement activities. This result emphasizes that a high level of social capital resources is needed for

the public acceptance of climate policies [39] and for collective action to cope with climate stress [36,40]. This study focuses on two key social capital resources for climate change mitigation behaviors. In the structural and cognitive dimensions of social capital, neighborliness and trust are expected to enable community members to collaborate in response to climate change through access to social connectedness and trustworthy relationships. For collaborative action to mitigate the climate crisis, neighborliness provides more opportunities to share resources, acquire information, and create norms of reciprocity [41,42]. Moreover, the trust shared among community members heightens their social interaction and interdependence, which in turn may lead to collective action for climate risk management and resilience. Social capital is a public good that empowers entire communities to cope with climate change [43]. Therefore, the following hypotheses are proposed:

H3. *Neighborliness will increase behavioral intention to collaborate with others for climate change mitigation.*

H4. *Trust will increase behavioral intention to collaborate with others for climate change mitigation.*

2.3. Moderating Roles of SOC-R, Neighborliness, and Trust

As discussed earlier, risk perceptions play a pivotal role in determining behaviors, including climate change mitigation. However, although perceived risks to individuals or society can motivate the intention to engage in actions, individuals are unlikely to act on the increased risk unless they also possess certain beliefs about effectively dealing with the risk [44,45]. Rimal and Limaye asserted that the relationship between perceived risk and behavioral change is not always consistent by reviewing prior research that shows its positive, negative, or insignificant impact on behavioral change. Rimal and Limaye also noted that a high level of perceived risk does not always result in corresponding behavior, but rather individuals need to be empowered to avert a threat when they are motivated to change their behavior. This suggests that it is necessary to identify important moderating variables as potential boundary conditions in the relationship between risk perception and behavioral modification.

Shi et al. [2] examined the moderating effects of efficacy beliefs on the relationship between the mitigating behaviors and societal risk perceptions of climate change. They found an insignificant interaction effect between societal risk perception and collective efficacy on the behavioral intention to engage in collective action. However, similar research [46] reported the interaction effect between societal risk perception and collective efficacy, which affects the intention to engage in collective actions against cancer. These results indicate that individuals empowered by certain efficacy beliefs are more likely to show a stronger influence of risk perception on certain types of behaviors. Despite these critical implications, few studies have identified additional moderating variables in the relationship between societal level risk and collaborative behavior for climate change mitigation.

As the moderating effect of efficacy beliefs on the relationship between societal risk perception and collaborative behavior should be considered, this study suggests that SOC-R, neighborliness, and trust could serve as other moderators. Given that environmental efficacy refers to people's belief in their ability to take action to mitigate or adapt to climate change [47], SOC-R, neighborliness, and trust are deemed as efficacy beliefs that motivate their collaborative behavior in perceiving climate change risk posed to future generations. Individuals with stronger SOC-R can fulfill their social responsibility to promote and protect the well-being of future generations. Accordingly, the societal risk perception of climate change to future generations coupled with stronger SOC-R will be more likely to result in collaborative behavior for climate change mitigation. In other words, SOC-R may act as an efficacy belief that underpins the association between societal risk perception and collaborative behavior because SOC-R occurs from individuals' belief systems and community contexts. Thus, SOC-R, as an outcome of the belief system and community context, may amplify the influence of the perception of societal risk to future generations on individuals' collaborative actions against climate change:

H5. *The relationship between societal risk perception and behavioral intention to collaborate with others for climate change mitigation will be stronger at higher SOC-R levels than at lower levels.*

Moreover, neighborliness and trust may provide individuals with perceived beliefs of control over collaborating with others to address climate change. In the structural dimension, neighborliness as a social conduit expands an individual's connectedness, socializing, and interaction with others [32,35]. Because the societal risk of climate change is rarely under an individual's control, the joint efforts of diverse social actors are needed. This means that neighborliness of society members can play a crucial role in empowering their sense of control over collaborative behavior towards climate issues. By producing tangible and intangible resources, neighborliness is expected to enhance efficacy beliefs in the process of amplifying or attenuating the influence of societal risk perception on collaborative behavior. Cho and Kuang [6] proposed such an efficacy belief as collective efficacy, which requires more collaboration with others to reduce societal risk. In the cognitive dimension, trust may also increase the likelihood of shaping efficacy beliefs through one party's confidence in another party's capabilities. Because trust is based on individuals' reliance on and expectations of others' behavior in an uncertain situation [34], it is more likely to reinforce mutual reciprocity and interaction among community members. When individuals' perceived confidence in cooperation and solidarity with others increases, their perception of societal risk to future generations may predict their intention to tackle climate change more strongly. Thus, trust will be more likely to moderate the relationship between societal risk perception and collaborative behavior, such that the relationship is more pronounced at high levels of trust.

H6. *The relationship between societal risk perception and behavioral intention to collaborate with others for mitigation of climate change will be stronger at higher levels of neighborliness than at lower levels.*

H7. *The relationship between societal risk perception and the behavioral intention to collaborate with others for mitigation of climate change will be stronger at higher levels of trust than at lower levels of trust.*

3. Methods

3.1. Participants

Given that nearly all (93.4%) of South Korean citizens own a smartphone [48], it was reasonable to use an online survey. The data were collected through a major research agency in South Korea. Pre-recruited panel members were used to draw a national proportional quota sample (sex, age, and geographic regions) through e-mail invitations. The respondents were assured that their participation was voluntary and that their answers would remain anonymous. The final sample ($N = 295$) comprised 49.5% male and 50.5% female respondents from one capital city, one special autonomous city, six metropolitan cities, and nine regional provinces, which make up South Korea. The ages of the participants ranged from 19 to 59 years ($M = 39.620$, $SD = 10.810$). The majority of the participants' education levels indicated a college degree or attending college (78.3%); the majority of the socioeconomic levels indicated 41.7% lower middle; and the majority of the political preferences indicated 61.0% moderate.

3.2. Measures

The questionnaire included the following variables: societal risk perception of climate change to future generations, SOC-R, trust, neighborliness, and collaborative behavioral intention. Except for the demographics, all items were measured using a Likert scale ranging from 1 (strongly disagree) to 7 (strongly agree).

Societal risk perception of climate change for future generations was measured by adopting and modifying items from prior research [1,19]. It included three items: "I think that climate change could be a serious problem for future generations", "I think that climate

change could be a significant issue for future generations”, and “I think that climate change could be a deadly problem for future generations” ($\alpha = 0.972$, $M = 6.136$, $SD = 0.980$).

Drawing on the scale developed by prior research [25,28], the SOC-R was assessed with modifications by asking the following statements: “When volunteers are needed by my community, I feel like I should be one of the first to step up”, “When others in my community need help, I believe I should be the first to step up”, and “I am always ready to help out people in my community even if it creates hardship for me” ($\alpha = 0.910$, $M = 4.306$, $SD = 1.083$).

Neighborliness was gauged by adopting and modifying items from a previous study [35]. It included three items: “I have frequently socialized with people in my community in person or online over the past three years”, “I have often given or received help from people in my community in person or online over the past three years”, and “I have often interacted with people in my community in person or online over the past three years” ($\alpha = 0.949$, $M = 4.779$, $SD = 1.192$).

Trust was gauged by adopting and modifying statements from previous research [35]. It included three items: “People in my community (school, workplace, small group, town, etc.) are trustworthy”, “People in my community (school, workplace, small group, town, etc.) are willing to help me when I need it”, and “People in my community (school, workplace, small group, town, etc.) are honest” ($\alpha = 0.922$, $M = 4.715$, $SD = 0.979$).

Collaborative behavioral intention was measured by adopting and modifying items from previous research [35]. It included three items: “If possible, I intend to participate with others in activities to respond to the climate crisis in person or online”, “If given the chance, I am willing to participate with others in activities to respond to the climate crisis in person or online”, and “In the future, I am likely to participate with others in climate crisis response activities in person or online” ($\alpha = 0.977$, $M = 4.706$, $SD = 1.268$).

3.3. Analytical Methods

This study first analyzed descriptive statistics and correlation (see Table 1) among all the observed variables. To examine the relationships between the four independent variables and behavioral intention (H1 to H4), a hierarchical multiple regression analysis was performed.

Table 1. Correlation coefficients and descriptive statistics.

	1	2	3	4	5	6	7	8	9	10
1. Sex (male = 0)	n.a.									
2. Age	−0.029	n.a.								
3. Education	−0.117 *	−0.093	n.a.							
4. Socioeconomic level	0.075	−0.050	0.098	n.a.						
5. Political preference	0.057	0.059	0.077	0.047	n.a.					
6. Perceived SR	0.195 **	0.065	−0.059	0.079	0.080	(0.972)				
7. SOC-R	−0.079	0.193 **	0.077	0.264 **	0.147 *	0.135 *	(0.910)			
8. Neighborliness	−0.070	0.042	0.173 **	0.298 **	0.086	0.078	0.479 **	(0.949)		
9. Trust	−0.022	−0.036	0.207 **	0.333 **	0.026	0.112	0.475 **	0.659 **	(0.922)	
10. Behavioral intention	0.063	0.310 **	0.055	0.114	0.137 *	0.226 **	0.472 **	0.213 **	0.234 **	(0.977)

Notes: Reliabilities are provided along the diagonal; * $p < 0.05$, ** $p < 0.01$.

The variables were entered from block one to block two to eliminate the effects of the control variables (i.e., five demographic indicators). To test H5 to H7, Model 1 of the SPSS PROCESS macro 4.1 [49] was selected and 5000 bootstrapped resamples were used. The independent and dependent variables were mean-centered for the conditional effects test. For Model 1, this study reports unstandardized regression weights and standard errors for all results. In addition, a Johnson–Neyman (JN) significance region test was performed to check the statistical significance of the interaction effects. The JN test compensates for the limitation of the traditional pick-a-point method of selecting some specific values (e.g., M , $M \pm 1SD$) to separate groups when testing interaction effects. It has the advantage of

providing the precise percentage of respondents in the significant region of the interaction and the score of the moderating variable corresponding to the threshold value.

4. Results

H1, H2, H3, and H4 predicted that the behavioral intention to collaborate with others for climate change mitigation would be increased by the societal risk perception of climate change to future generations, SOC-R, neighborliness, and trust. As presented in Table 2, the results of the hierarchical multiple regression analysis showed that the regression model accounted for 30.9% of the total variance in behavioral intention, as indicated by its total R^2 .

Table 2. Hierarchical regressions on the intention to collaborative behavior.

Block	I.V.s	β	t	R^2	ΔF
1	Sex (male = 0)	0.066	1.198	0.134 ***	8.924
	Age	0.318	5.763 ***		
	Education	0.073	1.310		
	Socioeconomic level	0.112	2.034 *		
	Political preference	0.103	1.870		
2	Perceived SR	0.139	2.729 **	0.309 ***	18.106
	SOC-R	0.399	6.581 ***		
	Neighborliness	−0.042	−0.610		
	Trust	0.057	0.823		

Notes. Perceived SR: perceived societal risk; * $p < 0.05$, ** $p < 0.01$, and *** $p < 0.001$.

The first block, containing sex ($\beta = 0.066$, $p > 0.232$), age ($\beta = 0.318$, $p < 0.001$), education ($\beta = 0.073$, $p > 0.191$), socioeconomic level ($\beta = 0.112$, $p < 0.05$), and political preference ($\beta = 0.103$, $p > 0.062$) variables, contributed 13.4% of the explanatory power [$F(5, 289) = 8.924$, $p < 0.001$]. The second block of perceived societal risk ($\beta = 0.139$, $p < 0.01$), SOC-R ($\beta = 0.399$, $p < 0.001$), neighborliness ($\beta = -0.042$, $p > 0.542$), and trust ($\beta = 0.057$, $p > 0.411$) explained 17.6% of behavioral intention [$F(4, 285) = 18.106$, $p < 0.001$]. These findings indicate that when controlling for the unique effect of the demographic variables, (1) higher perceived levels of societal risk and (2) higher perceived levels of SOC-R were positively related to individuals' intentions to collaborate with others for climate change mitigation. Additionally, older participants tended to evince their behavioral intentions. Thus, H1 and H2 were supported, whereas H3 and H4 were rejected.

H5, H6, and H7 predicted that SOC-R, neighborliness, and trust would be more likely to moderate the relationship between societal risk perception and collaborative behavior, such that the relationship is more pronounced at high levels of SOC-R, neighborliness, and trust, respectively. For H5, Table 3 shows that the effect between societal risk perception and behavioral intention was moderated by SOC-R (interaction term: $B = -0.116$, $SE = 0.047$, $p < 0.05$) after controlling for the demographic items.

Table 3. Regression model of behavioral intention (moderator: SOC-R).

Variables		Dependent Variable: Behavioral Intention					
		B	SE	t	p	$LLCI$	$ULCI$
Control variables	Sex	0.190	0.128	1.484	0.139	−0.062	0.442
	Age	0.026	0.006	4.379	0.000	0.014	0.037
	Education	0.138	0.136	1.019	0.309	−0.129	0.406
I.V.	Socioeconomic level	−0.013	0.070	−0.186	0.853	−0.151	0.125
	Political preference	0.088	0.099	0.898	0.370	−0.106	0.282
	Perceived SR	0.181	0.065	2.768	0.006	0.052	0.309

Table 3. Cont.

Variables		Dependent Variable: Behavioral Intention					
		B	SE	t	p	LLCI	ULCI
Moderator	SOC-R	0.480	0.062	7.745	0.000	0.358	0.602
Interaction term	Perceived SR × SOC-R	−0.116	0.047	−2.468	0.014	−0.209	−0.024

$R^2 = 0.322, F = 16.976^{***}, df = 8, 286$

*** indicates $p < 0.001$.

By presenting a visual depiction of the moderation at ± 1 standard deviations and mean, Figure 1 shows that societal risk perception was significantly and positively related to behavioral intention when SOC-R is both at one standard deviation below the mean ($b = 0.307, SE = 0.082, p < 0.001$) and at the mean ($b = 0.181, SE = 0.065, p < 0.01$).

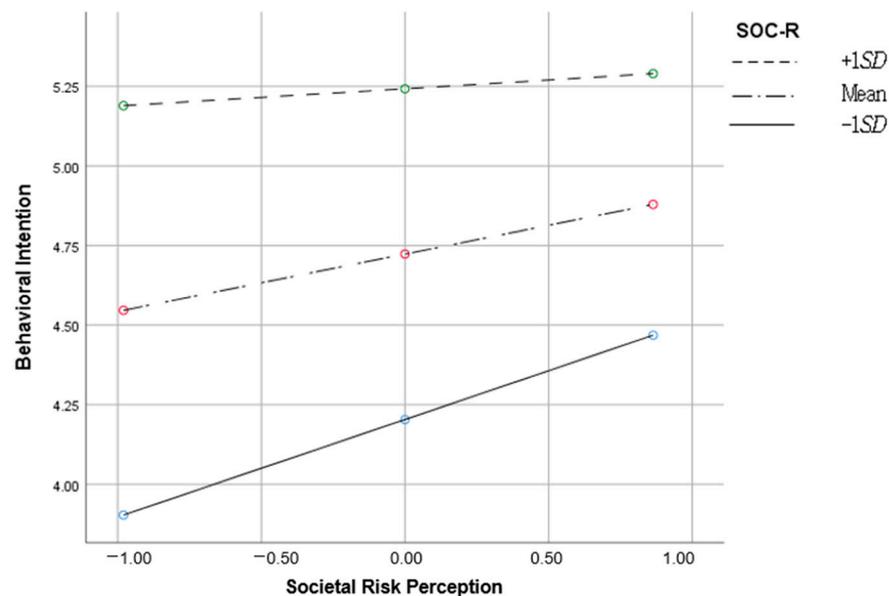


Figure 1. Effects of societal risk perception on behavioral intention by SOC-R.

However, among the respondents of groups who scored one standard deviation above the mean ($b = 0.055, SE = 0.084, p > 0.512$) on the SOC-R measure, the relationship between societal risk perception and behavioral intention was not significant. To further probe this interaction effect, a JN test was performed. The results revealed that, among the respondents who scored below the 68.81% percentile, societal risk perception was significantly and positively associated with behavioral intention. Thus, because the interaction's direction was opposite to what H5 predicted, H5 was partly supported.

As presented in Table 4 (H6), no significant interaction effect of neighborliness (interaction term: $B = -0.047, SE = 0.052, p > 0.367$) on the association between societal risk perception and behavioral intention was found after controlling for demographics.

This result indicates that the relationship between societal risk perception and behavioral intention will not be more likely to vary according to the level of neighborliness. Therefore, H6 was rejected.

Finally, Table 5 (H7) presents the significant interaction effect of trust (interaction term: $B = -0.103, SE = 0.051, p < 0.05$) on the association between societal risk perception and behavioral intention, after controlling for the demographics.

Table 4. Regression model of behavioral intention (moderator: neighborliness).

Variables		D.V.: Behavioral Intention					
		B	SE	t	p	LLCI	ULCI
Control variables	Sex	0.110	0.140	0.790	0.430	−0.164	0.385
	Age	0.035	0.006	5.491	0.000	0.022	0.047
	Education	0.164	0.149	1.096	0.274	−0.130	0.458
I.V.	Socioeconomic level	0.079	0.077	1.025	0.306	−0.073	0.231
	Political preference	0.162	0.107	1.516	0.131	−0.048	0.373
	Perceived SR	0.231	0.071	3.261	0.001	0.092	0.371
Moderator	Neighborliness	0.172	0.061	2.820	0.005	0.052	0.292
Interaction term	Perceived SR × Neighborliness	−0.047	0.052	−0.904	0.367	−0.148	0.055
$R^2 = 0.191, F = 8.455^{***}, df = 8, 286.$							

*** $p < 0.001$.**Table 5.** Regression model of behavioral intention (moderator: trust).

Variables		D.V.: Behavioral Intention					
		B	SE	t	p	LLCI	ULCI
Control variables	Sex	0.085	0.137	0.622	0.534	−0.185	0.356
	Age	0.036	0.006	5.780	0.000	0.024	0.048
	Education	0.130	0.148	0.876	0.382	−0.162	0.422
I.V.	Socioeconomic level	0.050	0.077	0.650	0.516	−0.101	0.200
	Political preference	0.174	0.105	1.652	0.100	−0.033	0.382
	Perceived SR	0.220	0.070	3.133	0.002	0.082	0.358
Moderator	Trust	0.256	0.074	3.458	0.001	0.110	0.401
Interaction term	Perceived SR × Trust	−0.103	0.051	−2.002	0.046	−0.203	−0.002
$R^2 = 0.214, F = 9.721^{***}, df = 8, 286$							

*** $p < 0.001$.

Figure 2 shows that societal risk perception was significantly and positively associated with behavioral intention when trust was low ($b = 0.320, SE = 0.087, p < 0.001$) and moderate ($b = 0.220, SE = 0.070, p < 0.01$).

However, among the respondents who had one standard deviation above the mean ($b = 0.120, SE = 0.085, p > 0.162$) on the measure of trust, societal risk perception did not significantly affect behavioral intention. The JN technique was employed to further investigate this interaction effect. The results showed that among the respondents who scored below the 77.63% percentile, societal risk perception was significantly and positively associated with behavioral intention. Therefore, because the direction of the moderating effect was opposite to what H7 expected, the data were partly consistent with H7.

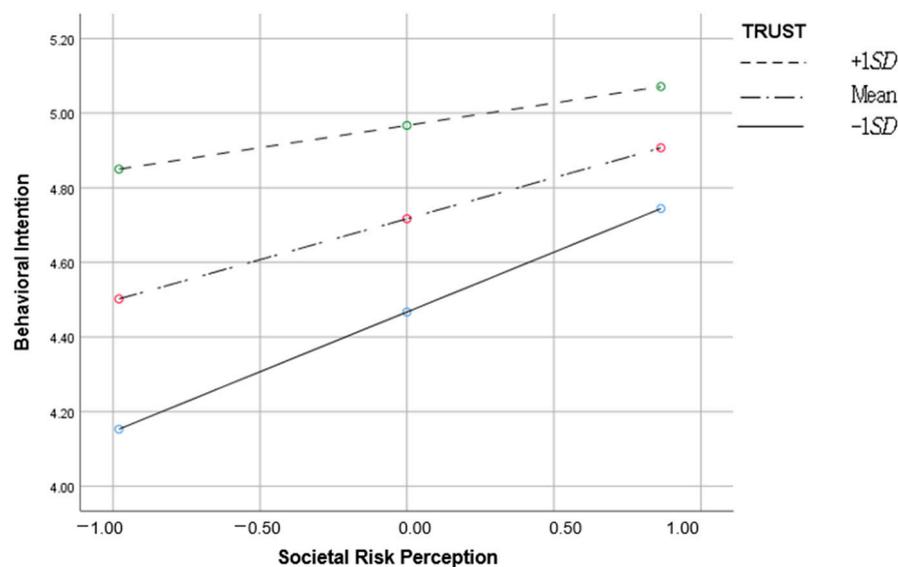


Figure 2. Effects of societal risk perception on behavioral intention by trust.

5. Discussion

By focusing on the important antecedents of collaborative behavior, this study examined whether societal risk perception, SOC-R, neighborliness, and trust affect the behavioral intention to collaborate with others to ameliorate climate change. Moreover, it analyzed the moderating roles of SOC-R, neighborliness, and trust in the impact of societal risk perception on collaborative behavior. The findings demonstrate that individuals' perceptions of societal risk to future generations and SOC-R are more likely to significantly increase their intention to collaborate towards climate change mitigation. Moreover, SOC-R and trust tend to serve as moderators that underpin the relationship between societal risk perception and collaborative behavior. Specifically, the relationship between societal risk perception and behavioral intention was stronger at lower levels of SOC-R and trust, respectively. These findings have vital implications for effective climate change policy making and communication practices in South Korea.

The perception of societal risk posed to future generations was found to be a significant predictor of collaborative behavior for climate change mitigation. This finding resonates with another study that revealed the impact of societal risk perception on collective action against climate change [2]. By advancing research on risk perception at the societal level, this study contributes to the extant literature on societal risk perception and behavioral change [e.g., 6,46], which has been relatively less examined compared to individual risk perception. Societal risk perception plays a pivotal role in predicting collaborative behavior, which requires a concerted effort in response to the risks posed by social or global problems. Furthermore, by focusing on the perceived risk of climate change that can harm future generations, this study provides insights into the psychosocial process and the effect of risk perception at the social level on collaborative behavior.

The significant influence of SOC-R on collaborative behavior suggests its critical role in enhancing civic engagement and virtue. This study parallels other studies that have found its impact on organizational citizenship behavior (e.g., [28–31]). This finding extends the influence of SOC-R from the organizational level to the societal level by examining it in the context of social and global issues. SOC-R should be considered a crucial antecedent of collective engagement that requires civic virtue and social responsibility such as climate change problem-solving activities. Thus, the strength of the SOC-R lies in its utility in explaining community members' management and collective action in risky or crisis situations.

Unexpectedly, this study revealed that the resources of social capital, neighborliness and trust, are not more likely to affect collaborative behavior for climate change mitigation.

This finding is inconsistent with those of recent research on social capital and climate change [36–38]. A reasonable explanation could be that this study simultaneously tested the significant influences of societal risk perception, SOC-R, neighborliness, and trust in a multiple regression model to compare the unique effects of each variable. Thus, in terms of collaboration to address climate change, societal risk perception and SOC-R are regarded as having far more salient influences than neighborliness and trust. Despite their insignificant effects, the role of neighborliness and trust as antecedents of civic engagement cannot be ignored because each is significantly and positively correlated with behavioral intention.

By analyzing the moderating roles of SOC-R, neighborliness, and trust, this study also demonstrates the boundary conditions in the causal relationship between societal risk perception and behavioral change. This study anticipated that the association between societal risk perception and behavioral change would be stronger when each moderator was at a higher level. However, the findings reported the opposite direction of the significant moderating effects of SOC-R and trust, which appears to be consistent with prior research [46]. Su and Shi [46] found that individuals with lower perceived collective efficacy were more likely to act on their perceived societal risk when engaging in collective actions against cancer. SOC-R and trust may not be directly related to collective efficacy. However, given that they can be deemed to be efficacy beliefs that motivate individuals' intention in doing something to avert risk, the study suggests a possible explanation for the opposite direction of the moderation effects. For example, the nature of collaborative behavior to mitigate climate change could be a boundary condition for understanding the interaction effect between moderators and societal risk perception. Moderation effects can vary according to the characteristics and purpose of the behavior.

As explained in prior research [44,45], perceived risks can be expected to be a motivator of behavioral intentions, but individuals' beliefs about how to deal with risk often play a necessary role in determining the corresponding behavior. This suggests the need for understanding the role of specific beliefs to promote collaborative behavior for climate change mitigation. By identifying critical moderating variables in the relationship between societal risk perception and collaborative behavior, the findings shed light on the factors influencing the process of climate change mitigation behavior. The findings are also important for developing effective climate change mitigation strategies and policies. In particular, at the societal level, moderating factors that amplify or attenuate the relationship can be understood. Thus, the salient contribution of this study lies in addressing a research gap pertaining to the examination of moderators influencing societal risk perception and collective action.

This study also has practical implications for communication programs aimed at promoting collaborative behavior for climate change mitigation. Because societal risk perception and SOC-R tend to have a more salient influence on collaborative behavior, practitioners can attempt to design campaign messages to emphasize that (1) climate change will negatively affect future generations and (2) every community member should be involved in environmental responsibility efforts and initiatives for the global problem. For example, campaign practitioners will need to use effective strategies that appeal to cognitions and emotions, such as saying that climate change can threaten the well-being of our children and grandchildren. They will also need to build community support, such as engaging local communities in climate action programs, by promoting SOC-R. Moreover, the results of the moderating effects of the SOC-R, trust, and JN analyses help practitioners segment target audiences more effectively and specifically.

This study had a few limitations. Respondents' actual behavior as the dependent variable was not measured. The cross-sectional analyses may also preclude insight into the causal relationship between the four independent variables and the behavioral intention to collaborate for climate change mitigation. In this regard, future research would benefit from a longitudinal panel-based approach or an experimental study, in addition to measuring actual behavior. Moreover, scholars may wish to explore other antecedents and moderators,

including action efficacy and institutional efficacy, as Cho and Kuang [6] postulated, which reflect societal risk reduction action in addressing climate change.

6. Conclusions

This study aimed to examine the effects of societal risk perception, SOC-R, neighborliness, and trust on collaborative behavior regarding climate change. The study advances research on the role of risk perceptions, SOC-R, and social capital resources regarding climate change and collaborative behavior. The perception of risk posed to future generations at the societal level is critical in predicting collaborative behavior towards climate change mitigation. It is also important that the direct influence of SOC-R on citizenship and engagement at the organizational level extends to the societal level. Furthermore, the study also identifies the boundary conditions in the causal relationship between societal risk perception and behavior change by examining the moderating roles of SOC-R, neighborliness, and trust. The moderating effects of SOC-R and trust help us understand the conditions under which societal risk perception is more likely to result in behavioral intention to collaborate towards climate issues. To date, few studies have attempted to compare the roles of societal risk perception, SOC-R, or social capital resources (i.e., neighborliness and trust) in affecting collaborative behavior regarding climate change within a single study. Overall, the study illustrates that societal risk perception and SOC-R play a crucial role in determining collaborative behavior while the relationship between societal risk perception and behavioral intention tends to be stronger at lower levels of SOC-R and trust, respectively. These findings have practical implications for the effective design of climate change policy and communication programs in South Korea.

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